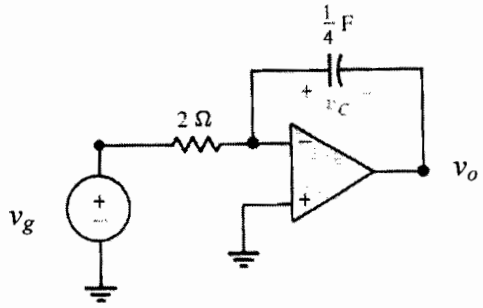
King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE207: Signals and Systems (081)
Quiz 6: Applications of Laplace Transforms

Serial #
- 1 points for not writing your serial number

Name: KEY Ver.

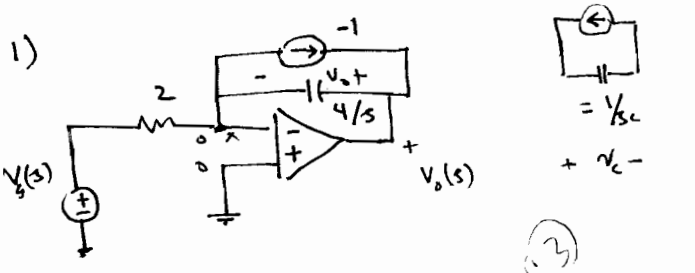
For the op-amp circuit shown in the figure, suppose that $v_c(0) = 4\text{V}$ and $v_g(t) = \cos 2t\, u(t)\ \text{V}$.



(Tables are attached, If needed)

1) Redraw the circuit in Laplace domain.
   Use the parallel Model for the capacitor.
2) Find $V_o(s)$
3) Find $v_o(t)$

1)



(3)

2) By KCL @ node x

$$\frac{V_g}{2} + 1 + \frac{V_o}{4/s} = 0$$

$$V_o = \frac{-4}{s}\left[1 + \frac{V_g}{2}\right]$$

$$V_o = \frac{-2}{s}\left[2 + V_g\right]$$

By Laplace Table

(3)

$$\mathcal{L}\left[\cos 2t\, u(t)\right] = \frac{s}{s^2+2^2}$$

$$V_o(s) = \frac{-2}{s}\left[2 + \frac{s}{s^2+2^2}\right]$$

$$= \frac{-4}{s} - \frac{2}{s^2+2^2}$$

3) $v_o(t)$

By inverse Laplace

$$\mathcal{L}^{-1}\left[V_o(s)\right] = -4\,u(t) - \sin 2t\, u(t) \quad \text{V}$$

$$v_o(t) = -4 - \sin 2t \quad \text{V} \qquad t \geq 0$$

$$= (-4 - \sin 2t)\, u(t) \quad \text{V}$$

(4)

Good Luck, **Dr. Ali Muqaibel**